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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
LAO, TIM P	
ART UNIT	**PAPER NUMBER**
2655	11

DATE MAILED: 05/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/851,133	BRETON, PIERRE-ALBERT	
	Examiner	Art Unit	
	Tim Lao	2655	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02/23/2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,7,13-17 and 19* is/are rejected.

7)☒ Claim(s) *5, 6, 8-12, and 18* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05/09/2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. In response to the Office Action of November 14, 2003, Applicants have submitted an Amendment, filed February 23, 2004, amending claims 1-3, 5-9, and 12-19, and arguing to overcome the art rejections. Claims 1-19 are pending in this application. Of the pending claims, claims 1 and 16 are independent claims.

Response to Arguments

2. Applicant's arguments with respect to claims 1-19 have been considered but are moot in view of the new ground(s) of rejection.

3. This is a Non-final Office Action in view of new ground(s) of rejection not necessitated by Applicant's amendment.

Drawings

4. Figures 1a, 1b should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-4, 13, 15-17, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art in view of Pastor et al. (U.S. Patent 6,438,513, hereinafter "Pastor[1]"), and further in view of Yamaguchi et al. (U.S. Patent 6,026,359, hereinafter "Yamaguchi").

Claim(s)	
1	<u>Applicant's admitted prior art shows:</u> A method of voice recognition in a noise-ridden acoustic signal comprising: a step of digitizing and subdividing the noise-ridden acoustic signal into a sequence of temporal frames; (Fig.1b: **1**) a step of parameterizing speech-containing temporal frames so as to obtain a vector of parameters, per speech containing frame, in the frequency domain, the vector of parameters expressing the acoustic contents of each speech containing frame; (Fig.1b: **2**) a shape-recognition step in which the vectors of parameters are assessed with respect to references pre-recorded in a reference space during a preliminary learning step, so as to obtain recognition by the determining of at least one reference which is closest to the vector of parameters; (Fig.1b: **3**) <u>Applicant's admitted prior art does not show:</u> a step of reiterative searching for successive noise models in the sequence of temporal frames, a new noise model replacing a current noise model, each noise model comprising several successive frames; a step of searching for a noise transition between the new noise model and the

current noise model; and wherein,

when the noise transition has been detected, the method comprises a step of updating the reference space as a function of the new noise model, the parameterizing step including a step of matching the parameters to the new noise model.

Pastor[1] teaches:

a step of reiterative searching for successive noise models in the sequence of temporal frames, a new noise model replacing a current noise model, each noise model comprising several successive frames; (see Abstract)

a step of searching for a noise transition between the new noise model and the current noise model; (Fig.3: "comparison with energy of the previous model")

Yamaguchi teaches:

a step of updating (adapting) the reference space (initial noisy speech model) as a function of the new noise model (noisy speech model after condition change); (Fig 3; col.2, ll.20-28; col.4, ll.47-67; col.5, ll.1-52)
{The initial noisy speech model are adapted the new noisy speech model after a detection of a change in the energy spectrum. It would be obvious to match to the parameters to the new noisy speech model since the new noisy speech model represents the most current and updated model.}

a step of matching the parameters to the new noise model. (Fig.3: **11**, **12**)
*{speech recognition **11** is performed using the adapted noisy speech model **12**.}*

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the speech recognition method of Applicant's admitted prior art to include the reiterative and noise transition search of Pastor[1] and the step of updating a reference space as a function of a new noise model as taught by Yamaguchi in order to improve the robustness of speech recognition. The reiterative search method for noise reduction is useful in aircraft where noise from engines, air-conditioning, aerodynamics are continuously presented and where intelligent speech recognition in such noisy environment is

	important (Pastor[1], col.1, ll.14-42). The updating of noise models is useful for improving recognition rate (Yamaguchi: col.1, ll.21-52).
Claim(s) 2	modified The ~~combination of~~ Applicant's admitted prior art ~~and Pastor[1]~~ would show: A method of voice recognition according to claim 1, wherein the step of searching for a noise transition comprises a step of searching for an energy incompatibility and/or a step of searching for a spectral incompatibility between the new noise model and the current model, the detection of an incompatibility expressing a noise transition. (Pastor[1]: col.4, ll.55-67; col.5, ll.1-8) *{spectral incompatibility search is met by mean energy comparison between the old and new noise model.}*
Claim(s) 3	modified The ~~combination of~~ Applicant's admitted prior art ~~and Pastor[1]~~ would show: A method of voice recognition according to claim 2, wherein the step of searching for an energy incompatibility comprises a comparison of the ratio between a mean energy Enewmod of the new noise model and a mean energy of the current noise model Emodcurr with a low threshold S' and a high threshold S, an energy incompatibility being found if the ratio is outside the interval delimited by the two thresholds S, S'. (Pastor[1]: col.5, ll.58-67; col.6, ll.1-6)
Claim(s) 4	modified The ~~combination of~~ Applicant's admitted prior art ~~and Pastor[1]~~ would show: A method of voice recognition according to claim 3, wherein the step of searching for an energy incompatibility also comprises a comparison of the mean energy Enewmod of the new noise model and the mean energy of the current noise model Emodcurr with an energy floor threshold Emin below which the noise is negligible, the energy incompatibility determined by the comparison of the ratio between the mean energy of the new noise model Enewmod and the mean energy of the current noise model Emodcurr being ignored when the mean energy of the new noise model Enewmod and the mean energy of the current noise model Emodcurr are both below the energy floor threshold Emin. (Pastor[1]: Fig. 3: "Halt the formulation", col.6, ll.25-34) *{Emin can be a value ≤ 1/S (S'=1/S) in which case the comparison of ratio of mean energy is abandoned due to insignificant presence of ambient noise.}*

Claim(s) 13	Applicant's admitted prior art shows: A method according to claim 1, using, as references, a sequence of temporal frames corresponding to one or more words, this sequence of frames being identified by a series of vectors of parameters, said parameters being obtained by compression of spectral coefficients. (Fig.1b: **2**, **3**)
Claim(s) 15	Applicant's admitted prior art shows: A method according to claim 1, comprising a step of noise-suppression in the speech-containing temporal frames before the parameterizing step. (Fig.1b: **6**)
Claim(s) 16	Applicant's admitted prior art shows: A system of voice recognition in a noise-ridden acoustic signal comprising: means to acquire the noise-ridden acoustic signal, digitize the noise-ridden acoustic signal and subdivide subdivide the noise-ridden acoustic signal into temporal frames; (Fig.1b: **1**) a parameterizing chain to translate the temporal frames containing speech into vectors of parameters in the frequency domain; (Fig.1b: **2**) shape-recognition means with a reference space having references acquired during a learning stage, to compare the vectors of parameters coming from the parameterizing chain with the references, so as to obtain recognition by the determination of a reference that most closely approaches the vectors of parameters; (Fig.1b: **3**) Applicant's admitted prior art does not show: means for modeling the noise to reiteratively prepare noise models, a new noise model replacing a current noise model; means for detecting a noise transition between the new noise model and the current noise model;

means to match the parameterizing chain with the new noise model having activated the noise transition; and

means to update the references of the reference space as a function of a noise level of the new noise model having activated the noise transition.

<u>Pastor[1] teaches:</u>

means for modeling the noise to reiteratively prepare noise models, a new noise model replacing a current noise model; and (see Abstract)

means for detecting a noise transition between the new noise model and the current noise model. (Fig.3: "comparison with energy of the previous model")

<u>Yamaguchi teaches:</u>

means to match the parameterizing chain with the new noise model having activated the noise transition; (Fig.3: **11**, **12**) and
*{speech recognition **11** is performed using the adapted noisy speech model **12**.}*

means to update (adapting) the references of the reference space (initial noisy speech model) as a function of a noise level of the new noise model (noisy speech model after condition change) having activated the noise transition. (Fig 3; col.2, ll.20-28; col.4, ll.47-67; col.5, ll.1-52)
{The initial noisy speech model are adapted the new noisy speech model after a detection of a change in the energy spectrum. It would be obvious to match to the parameters to the new noisy speech model since the new noisy speech model represents the most current and updated model.}

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the speech recognition method of Applicant's admitted prior art to include the reiterative and noise transition search of Pastor[1] and the means of updating a reference space as a function of a new noise model as taught by Yamaguchi in order to improve the robustness of speech recognition. The reiterative search method for noise

	reduction is useful in aircraft where noise from engines, air-conditioning, aerodynamics are continuously presented and where intelligent speech recognition in such noisy environment is important (Pastor[1], col.1, ll.14-42). The updating of noise models is useful for improving recognition rate (Yamaguchi: col.1, ll.21-52).
Claim(s) 17	<u>The combination of Applicant's admitted prior art, Pastor[1], and Yamaguchi would show:</u> A system of voice recognition according to claim 16, wherein the means used to update the references of the reference space comprise a first memory space (Fig.3: **11**) to store the updated references, said updated references having to replace current references used for shape recognition before the detection of the noise transition, said current references being stored in a second memory space (Fig.3: **6**). (Yamaguchi: Fig.3)
Claim(s) 19	<u>Applicant's admitted prior art shows:</u> A voice-recognition system according to claim 16, comprising means for noise-suppression (Fig.1b: **6**) in the speech-containing temporal frames before the speech containing temporal frames are translated by said parameterizing chain (Fig.1b: **2**).

7. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art in view of Pastor[1] and Yamaguchi, and further in view of Pastor et al. (U.S. Patent 6,445,801, hereinafter "Pastor[2]").	
Claim(s) 7	<u>The modified Applicant's admitted prior art does not show:</u> A method of voice recognition according to claim 1, wherein the parameterizing step comprises a step of determining spectral coefficients Bi,par, each associated with a frequency channel i each expressing a representation of a spectral energy of a frame containing speech in the frequency channel i, the parameter-matching step comprising a determining, for each spectral coefficient Bi,par, of a robustness operator OpRob(Bi,par), the robustness operator expressing the confidence to be attached to the spectral coefficient Bi,par with respect to the noise level of the new noise model in the same frequency channel i, a weighting of the

spectral coefficient Bi,par with the robustness operator OpRob(Bi,par) and a determining of the vector of parameters on the basis of the weighted spectral coefficients.

Pastor[2] teaches:

a parameterizing step comprises:

a step of determining spectral coefficients Bi,par ("$\gamma_i(\nu)$, $\gamma_x(\nu)$"), each associated with a frequency channel i (ν) each expressing a representation of a spectral energy of a frame containing speech in the frequency channel I (Fig.8, estimation of "$\gamma_i(\nu)$, $\gamma_x(\nu)$"; col.14, ll.17-20), the parameter-matching step comprising:

a determining, for each spectral coefficient Bi,par ("$\gamma_i(\nu)$, $\gamma_x(\nu)$"), of a robustness operator OpRob(Bi,par) (e.g., α), the robustness operator expressing the confidence (e.g., weighting of spectral coefficients on α: see eq.8) to be attached to the spectral coefficient Bi,par with respect to the noise level of the new noise model in the same frequency channel i, (col.7, eq.8; col.8, ll.10-18)

a weighting of the spectral coefficient Bi,par with the robustness operator OpRob(Bi,par) and (col.7, eq.8; col.7, ll.66-67; col.8, ll.1-6; col.8, ll.37)

a determining of the vector of parameters on the basis of the weighted spectral coefficients. (Fig.8, "computation of the Wiener coefficient"; col.7, eq.8)

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to include the spectral coefficient determination step of Pastor[2] in the modified Applicant's admitted prior art in order to perform noise suppression using Wiener filter. Wiener filter is a commonly used noise filter (Pastor[2]: col.1, ll.58-67; col.2, 1-5)

8. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art in view of Pastor[1] and Yamaguchi, and further in view of Takahashi et al. (U.S. Patent 5,793,891, hereinafter "Takahashi").	
Claim (s) 14	The modified Applicant's admitted prior art does not show: A method according to claim 1, using, as references, a sequence of temporal frames corresponding to one or more phonemes, said sequence of frames being identified by a center and a standard deviation of a Gaussian function, said center and said standard deviation depending on the parameters of the vectors of parameters of the frames. Takahashi teaches: using, as references, a sequence of temporal frames corresponding to one or more phonemes, said sequence of frames being identified by a center (mean) and a standard deviation (variance) of a Gaussian function, said center and said standard deviation depending on the parameters of the vectors of parameters of the frames. (col.14, ll.13-30; col.2, ll.31-47) It would have been obvious to a person of ordinary skill in the art at the time the invention was made to include in the modified Applicant's admitted prior art the representation of reference phonemes by Gaussian functions as taught by Takahashi in order model the noisy speech using Gaussian functions. The Gaussian function is commonly used to model additive noise and provides a good noise model to model noises in noisy speech.

Allowable Subject Matter

9. Claims 5, 6, 8-12, and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter:

Claim(s) 5	The prior art fails to show: A method of voice recognition according to claim 2, wherein the step of searching for spectral incompatibility comprises, on the basis of spectral coefficients Bi,modcurr Bi,newmod respectively expressing a spectral energy of frames of the current noise model and a spectral energy of frames of the new noise model in at least one frequency channel i, a comparison of the ratio between the spectral coefficient Bi,newmod associated with the frequency channel i of the new noise model and the spectral coefficient Bi,modcurr associated with the same frequency channel i of the current noise model with a low threshold Sf' and a high threshold Sf, a spectral incompatibility being found if the ratio is located outside the interval delimited by the two thresholds, Sf, Sf'.
Claim(s) 6	The prior art fails to show: A method of voice recognition according to claim 5, wherein the step of searching for a spectral incompatibility also comprises, for at least one frequency channel i, a comparison of the spectral coefficient Bi,newmod of the new noise model in the frequency channel i and of the spectral coefficient Bi,modcurr of the current noise model in the frequency channel i with a floor spectral coefficient Bi,min associated with the frequency channel i, namely a floor below which the noise is negligible, a spectral incompatibility determined by the comparison of the ratio between spectral coefficients being ignored when, for the frequency channel i, the spectral coefficients of the new noise model and of the current noise model are both below the floor spectral coefficient Bi,min.
Claim(s) 8	The prior art fails to show: A method according to claim 7, wherein the robustness operator OpRob(Bi,par) verifies the following relationship:

	$$OpRob(B_{i,par}) = \left\{\max\left(0.25 + \frac{B_{i,par} - P(B_{i,new\,mod})}{B_{i,par} + 2P(B_{i,new\,mod})}, 0\right)\right\}^2$$ Bi,par being the spectral coefficient and P(Bi,newmod) being a parameter dependent on the noise level of the new noise model having activated the transition in the frequency channel i.
Claim(s) 9	The prior art fails to show: A method of voice recognition according to claim 1, further comprising reference space updating step comprising the following operations, on the basis of basic spectral coefficients each associated with a frequency channel i, each expressing a spectral energy of a basic frame obtained during the learning step: the determining of a robustness operator OpRob(Bi,base) for each basic spectral coefficient Bi,base, the robustness operator expressing the confidence to be attached to the basic spectral coefficient Bi,base with respect to a noise level of the new noise model in the same frequency channel i, a weighting of the basic spectral coefficients Bi,base with the respective robustness operators OpRob(Bi,base), and preparation of the updated references with the weighted basic spectral coefficients.
Claim(s) 10	The prior art fails to show: A method according to claim 9, wherein the robustness operator OpRob(Bi,base) for the updating of the reference space verifies the following relationship: $$OpRob(B_{i,base}) = \left\{\max\left(0.25 + \frac{B_{i,base} - P(B_{i,new\,mod})}{B_{i,base} + 2P(B_{i,new\,mod})}, 0\right)\right\}^2$$ Bi,base being the basic spectral coefficient and P(Bi,newmod) being a parameter depending on the noise level of the new noise model having activated the transition, in the frequency channel i.

Claim(s)	The prior art fails to show:
Claim(s) 11	The prior art fails to show: A method according to claim 9, in which the references are prepared on the basis of compressed basic spectral coefficients, wherein the method uses a conversion table to convert the compressed basic spectral coefficients into compressed and weighted basic spectral coefficients.
Claim(s) 12	The prior art fails to show: A method according to claim 11, wherein the conversion table contains the non-compressed basic spectral coefficients Bi,base obtained by application of the reverse of the compression function to the compressed basic coefficients and wherein the method comprises: determining the robustness operator OpRob(Bi,base) for each of the non-compressed basic spectral coefficients Bi,base, a weighting of the non-compressed basic spectral coefficients Bi,base, a compression of the non-compressed and weighted basic spectral coefficients so as to obtain the compressed and weighted basic spectral coefficients.
Claim(s) 18	The prior art fails to show: A voice-recognition system according to claim 16, comprising a memory space to store compressed basic spectral coefficients obtained from basic spectral coefficients each associated with a frequency channel i, said basic spectral coefficients each expressing the spectral energy of a basic frame coming from the learning stage, a conversion table to convert the compressed basic spectral coefficients into compressed and weighted basic spectral coefficients, each weighted by a robustness operator OpRob(Bi,base) as a function of the noise level of the new noise model having activated the noise transition and of the basic spectral coefficient (Bi,base) to be weighted, said compressed and weighted basic spectral coefficients being used for the updating of the references of the reference space.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tim Lao whose telephone number is 703-305-8955. The examiner can normally be reached on M-F, 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Doris To can be reached on 703-305-4827. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Tim Lao
Examiner
Art Unit 2655

05/19/04

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SUPERVISORY PATENT EXAMINER
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